VERIFICATION OF A TRANSLATION

I, the below named translator, hereby declare that:

My name and post office address are as stated below;

That I am knowledgeable in the English language and in the language in which the below identified Japanese application was filed, and that I believe the attached English translation of the Japanese Patent Application No. 2000-056185 filed on March 1, 2000 is a true and complete translation of the above-identified Japanese application as filed.

Date: February 6, 2003

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[Document Name] Specification

[Title of the Invention] MASSAGING APPARTUS

[Claims]

1. A massaging apparatus comprising a supporting arm (26) having a therapeutic member and being pivotally supported thereon and movable along the body of a user, characterized in that the position of specific portion of the user with respect to the massaging apparatus is determined from the relation between the vertical position of the supporting arm (26) and the pivotal position of the supporting arm (26).

2. A massaging apparatus comprising a supporting arm (26) having a therapeutic member and being pivotally supported thereon and movable along the body of a user, characterized in that a pivotal-position-detecting sensor (60) for detecting that the supporting arm (26) reached a prescribed range of pivotal movement is provided.

3. A massaging apparatus comprising a supporting arm (26) having a therapeutic member and being pivotally supported thereon and movable along the body of a user, characterized in that a pivotal-position-detecting sensor (60) for detecting the pivotal position of the supporting arm (26) is provided.

4. A massaging apparatus comprising a supporting arm (26) having a therapeutic member and being pivotally supported thereon and movable along the body of a user, characterized in that the position of the specific portion of the user with

respect to the massaging apparatus is determined from the vertical position of the supporting arm (26) at the moment when the pivotal position of the supporting arm (26) reached a prescribed range.

5. A massaging apparatus as set forth in Claim 2, characterized in that the pivotal-position-detecting sensor (60) comprises an optical sensor having a light emitting element (57) and a light receiving element (58), and the fact that the supporting arm (26) reached the prescribed range of pivotal movement is detected by determining whether or not light from the light emitting element (57) is received by the light receiving element (58).

6. A massaging apparatus as set forth in Claim 2, characterized in that the pivotal-position-detecting sensor (60) comprises a limit switch (63), and the fact that the supporting arm (26) reached the prescribed range of pivotal movement is detected by switching of the limit switch (63) between ON and OFF.

7. A massaging apparatus as set forth in Claim 2, characterized in that the pivotal-position-detecting sensor (60) comprises a lead switch (66), and the lead switch (66) is switched between ON and OFF by the change of the magnetic field at the moment when the supporting arm (26) reached the prescribed range of pivotal movement.

8. A massaging apparatus as set forth in Claim 3,

characterized in that the pivotal-position-detecting sensor (60) comprises a variable resistor (69) or an encoder of which the output varies according to the pivotal position of the supporting arm (26).

9. A massaging apparatus as set forth in Claim 3, characterized in that the pivotal-position-detecting sensor (60) comprises a magnetoelectric converting element, and the output of the magnetoelectric converting element varies according to the variation in magnetic field according to the pivotal position of the supporting arm (26).

10. A massaging apparatus as set forth in Claim 1 or 4, characterized in that the position of the specific portion of the user to be determined is the position of the shoulder.

11. A massaging apparatus as set forth in Claim 2 or 3, characterized in that there are provided a pair of left and right supporting arms (26) and a pair of pivotal-position-detecting sensors (60) corresponding to the respective supporting arms (26).

[Detailed Description of the Invention]

[Industrially Applicable Field]

The present invention relates to a massaging apparatus.

[Prior Art]

For example, in a chair type massaging apparatus having a seat portion and a seatback portion and comprising a massaging

unit provided on the seatback portion so as to move upward and downward, a transmitting mechanism of the massaging unit comprises a pair of right and left supporting arms, a pair of right and left driving arms for transmitting power to the supporting arms, the supporting arm being connected to the driving arm at the midsection thereof, a first therapeutic member (the upper therapeutic member) provided on one end portion (upper end portion) of the supporting arm, and a second therapeutic member (lower therapeutic member) provided on the other end portion (lower end portion) of the supporting arm, so that a power is transmitted to the first therapeutic member and the second therapeutic member through the driving arm and the supporting arm to make the first therapeutic member and the second therapeutic member perform massage by the kneading action and the rapping action (for example, Japanese Patent Laid-Open No. HEI 9-262263).

Since this type of the massaging apparatus of the related art is not generally constructed to recognize the position of the specific portion of the human body such as shoulders or the hip of the user with respect to the massaging apparatus automatically, for example, when the user makes the massaging apparatus automatically perform shoulder massage or hip massage successively by selecting an automatic operation course, the user had to change the sitting position so that the therapeutic member of the supporting arm is placed exactly

on the desired location of the human body, or to operate the controller manually for fine adjustment of the moving position of the massaging unit (supporting arm).

In case of stimulating pressure points, which is well on its way to becoming a boom recent years, it is necessary to pinpoint the positions of the pressure points from the specific portion of the human body, such as shoulder, to some extent (for example about ± 1 cm). However, there is a problem in that accurate positioning of the therapeutic member of the massaging unit with respect to the pressure points is difficult and thus the effective stimulation of the pressure points cannot be performed, since the position of the specific portion of the human body such as shoulders of the user with respect to the massaging apparatus cannot be recognized automatically. For example, when performing kneading, rapping, and acupressure automatically for recovering from fatigue, though it is necessary to massage the specific position called "tenchu" and to apply acupressure therapy to the positions called "haiyu" and "kakuyu", it could not place the massaging member exactly on these pressure points.

There is also a conventional massaging apparatus with an automatic massaging function that performs massaging motion according to the preset program while successively changing operating modes, operating positions, and operating time periods of the therapeutic member, comprising a massaging unit

that makes the therapeutic member perform rapping motion or kneading motion or the like by the rotating power of the motor and is provided in the seatback portion, wherein the vertical distribution of the pressure applied to the therapeutic member from the human body is obtained by moving the therapeutic member upward and downward while maintaining the extent of projection of the therapeutic member toward the human body to determine the position of shoulders therefrom (for example, Japanese Patent Laid-Open No. HEI 6-190012).

However, the detection of the pressure in this case is performed by detecting the displacement of the spring that is compressed by a reaction force generated when the therapeutic member presses the human body from the back via an arm or the like, or by detecting the pressure applied to the therapeutic member from the human body by mechanical displacement, and thus it is difficult to detect a slight change in pressure applied to the therapeutic member from the human body. As a consequence, the positions of the shoulders and the hip of the user cannot be determined accurately, and it is difficult to place the position of the therapeutic member exactly on the pressure points of the body, and thus effective massaging cannot be performed in case where it is desired to apply acupressure therapy to the pressure points suitable to the symptom successively and automatically.

In addition, there is recognized another problem in that

an arm for transmitting a reaction force applied when the therapeutic member presses the human body from the back, a spring for receiving a reaction force from the massaging member, and a spring holding mechanism for holding the spring are additionally required in order to detect the pressure that is applied to the therapeutic member by the human body by mechanical displacement thereof, thereby complicating the construction of the pressure detection mechanism.

[Problems to be Solved by the Invention]

With the problems described above in view, the present invention provides a massaging apparatus that can determine the specific portion of the user's body such as shoulders with respect to the massaging apparatus automatically and accurately in a simple construction.

[Means for Solving the problem]

The technical means of the present invention to solve the above-described problems is, in a massaging apparatus comprising a supporting arm 26 having a therapeutic member and being pivotally supported and movable along the body of the user, that the position of specific portion of the user with respect to the massaging apparatus is determined from the relation between the vertical position of the supporting arm 26 and the pivotal position of the supporting arm 26.

In this case, in a massaging apparatus wherein the midsection of the supporting arm 26 is pivotally connected to

the driving arm 25 for transmitting a power to the supporting arm 26, a first therapeutic member 8 is mounted on one end of the supporting arm 26, a second therapeutic member 9 is mounted on the other end of the supporting arm 26, and the supporting arm 26 is movable along the user's body together with the driving arm 25, it may be constructed in such a manner that the position of the specific portion of the user with respect to the massaging apparatus can be determined from the relation between the vertical position of the supporting arm 26 and the pivotal position of the supporting arm 26 with respect to the driving arm 25.

In this case, the supporting arm 26 and the driving arm 25 may be moved along the user's body with the first therapeutic member 8 and the second therapeutic member 9 being kept into contact with the user to determine the position of the specific portion of the user with respect to the massaging apparatus from the relation between the vertical position of the supporting arm 26 and the pivotal position detected by a pivotal-position-detecting sensor 60.

Another technical means of the present invention is, in a massaging apparatus comprising a supporting arm 26 having a therapeutic member and being pivotally supported thereon and movable along the body of the user, that a pivotal-position-detecting sensor 60 for detecting that the supporting arm 26 reached the prescribed range of pivotal movement is

provided.

In this case, in a massaging apparatus wherein the midsection of the supporting arm 26 is pivotally connected to the driving arm 25 for transmitting a power to the supporting arm 26, a first therapeutic member 8 is mounted on one end of the supporting arm 26, a second therapeutic member 9 is mounted on the other end of the supporting arm 26, and the supporting arm 26 is movable along the user's body together with the driving arm 25, there may be provided a pivotal-position-detecting sensor 60 for detecting that the supporting arm 26 reached the prescribed range of pivotal movement with respect to the driving arm 25.

Still another technical means of the present invention is, in a massaging apparatus comprising a supporting arm 26 having a therapeutic member and being pivotally supported and movable along the body of the user, that a pivotal-position-detecting sensor 60 for detecting the pivotal position of the supporting arm 26 is provided.

In this case, in a massaging apparatus wherein the midsection of the supporting arm 26 is pivotally connected to the driving arm 25 for transmitting a power to the supporting arm 26, a first therapeutic member 8 is mounted on one end of the supporting arm 26, a second therapeutic member 9 is mounted on the other end of the supporting arm 26, and the supporting arm 26 is movable along the user's body together with the

driving arm 25, there may be provided a pivotal-position-detecting sensor 60 for detecting the pivotal position of the supporting arm 26 with respect to the driving arm 25.

Further technical means of the present invention is, in a massaging apparatus comprising a supporting arm 26 having a therapeutic member and being pivotally supported and movable along the body of the user, that the position of the specific portion of the user with respect to the massaging apparatus is determined from the vertical position of the supporting arm 26 at the moment when the pivotal movement of the supporting arm 26 reached the prescribed range.

In this case, in a massaging apparatus wherein the midsection of the supporting arm 26 is pivotally connected to the driving arm 25 for transmitting a power to the supporting arm 26, a first therapeutic member 8 is mounted on one end of the supporting arm 26, a second therapeutic member 9 is mounted on the other end of the supporting arm 26, and the supporting arm 26 is movable along the user's body together with the driving arm 25, it may be constructed in such a manner that a pivotal-position-detecting sensor 60 for detecting the pivotal position of the supporting arm 26 with respect to the driving arm 25 is provided, and the supporting arm 26 and the driving arm 25 are moved together along the user's body with the first therapeutic member 8 and the second therapeutic member 9 being kept into contact with the user to determine

the position of the specific portion of the user with respect to the massaging apparatus from the vertical position of the supporting arm 26 at the moment when the pivotal-position-detecting sensor 60 detected that the supporting arm 26 reached the prescribed range of pivotal movement with respect to the driving arm 25.

Still further technical means of the present invention is that the pivotal-position-detecting sensor 60 comprises an optical sensor having a light emitting element 57 and a light receiving element 58, and the fact that the supporting arm 26 reached the prescribed range of pivotal movement is detected by determining whether or not light from the light emitting element 57 is received by the light receiving element 58.

Another technical means of the present invention is that the pivotal-position-detecting sensor 60 comprises a limit switch 63, and the fact that the supporting arm 26 reached the prescribed range of pivotal movement is detected by switching of the limit switch 63 between ON and OFF.

Still another technical means of the present invention is that the pivotal-position-detecting sensor 60 comprises a lead switch 66, and the lead switch 66 is switched between ON and OFF by the change of the magnetic field at the moment when the supporting arm 26 reached the prescribed range of pivotal movement.

Another technical means of the present invention is that

the pivotal-position-detecting sensor 60 comprises a variable resistor 69 or an encoder of which the output varies according to the pivotal position of the supporting arm 26.

Another technical means of the present invention is that the pivotal-position-detecting sensor 60 comprises a magnetoelectric converting element, and the output of the magnetoelectric converting element varies according to the variation in magnetic field according to the pivotal position of the supporting arm 26.

Another technical means of the present invention is that the position of the specific portion of the user to be determined is the position of the shoulder.

Another technical means of the present invention is that there are provided a pair of left and right supporting arms 26 and a pair of pivotal-position-detecting sensors 60 corresponding to the respective supporting arms 26.

In this case, the pivotal position can be detected more accurately while preventing erroneous detection by the pivotal-position-detecting sensor 60, for example, by taking the matched values or by averaging the values from the values detected by both of the pair of pivotal-position-detecting sensors 60.

[Mode for Carrying Out the Invention]

Hereinafter, embodiments of the present invention will be described referring to figures.

Fig. 4 shows a general construction of a chair type massaging apparatus 1. In Fig. 4, the chair type massaging apparatus 1 comprises a seat portion 3 supported by a leg body 2, a seatback portion 4 provided on the back side of the seat portion 3, and arm rest portions 5 provided on both of the left and the right sides of the seat portion 3. The seatback portion 4 is adapted to be reclined by a reclining device 6 with the rear end side of the seat portion 3 as a fulcrum point.

A massaging unit 7 is provided in the seatback portion 4. The massaging unit 7 comprises, as shown in Fig. 5 as well, a first therapeutic member (kneading ball, massaging roller) 8, a second therapeutic member (kneading ball, massaging roller) 9, a massage motor 10, a transmission mechanism 11 for transmitting the rotational power of the massage motor 10 to the therapeutic members 8, 9 to allow the respective therapeutic members 8, 9 to perform kneading motion or rapping motion, and a supporting frame 14, wherein the massaging unit 7 is constructed so as to move in the seatback portion 4 vertically by a hoist means 13.

The hoist means 13 employs a mechanism that moves the massaging unit 7 upward and downward by rotating a feed screw 15 threadingly engaged with the supporting frame 14 of the massaging unit 7 by means of the hoist motor 16.

The hoist means 13 may be replaced with means employing a wrapping drive mechanism, a rack-and-pinion engaging

structure, or a hoist drive structure using a fluid pressure cylinder or the like.

The transmission mechanism 11 of the massaging unit 7 comprises, as shown in Fig. 5 to Fig. 7, a drive unit 21 having a kneading motion shaft 19 and a rapping motion shaft 20 projecting toward the left and the right sides, a pair of left and right drive arms 25 held by the motion shafts 19, 20, and a pair of left and right supporting arms 26 fixed on the tips of the respective drive arms 25.

The above-described drive unit 21 can be switched as desired between a state of allowing the drive arm 25 to take the components of lateral movement out from the rotating power of the massage motor 10 via the kneading motion shaft 19 to perform kneading motion, and a state of allowing the drive arm 25 to take components of fore-and-aft swinging motion out from the rotating power of the massage motor 10 via the rapping motion shaft 20 to perform rapping motion.

The motion shafts 19, 20 are laterally arranged in parallel with each other and rotatably supported on the case of the drive unit 21 via bearings respectively. These motion shafts 19, 20 are adapted in such a manner that one of these two shafts is selected at a transmission mechanism 11 to receive rotational motion from the massage motor 10 to rotate in the directions shown by the arrows A or B in Fig. 11.

The rapping motion shaft 20 is provided on both ends

thereof with an eccentric shaft portions 20A, 20A that are off-centered in the opposite direction from each other, and the kneading motion shaft 19 is provided with a inclined shaft portions 19A, 19A on both ends. The eccentric shaft portion 20A of the rapping motion shaft 20 and the inclined shaft portion 19A of the kneading motion shaft 19 are connected by a linkage 28. The linkage 28 comprises a plate-shape drive arm 25, a ball joint 29 connected to the drive arm 25, and a connecting arm 31 connected to the shaft portion of the ball joint 29 by a pin 30. The drive arm 25 is rotatably supported on the inclined shaft portion 19A, and the connecting arm 31 is pivotally mounted on the eccentric shaft portion 20A.

In this arrangement, when the rapping motion shaft 20 rotates in the direction A, the eccentric shaft portion 20A of the rapping motion shaft 20 allows the therapeutic members 8, 9 to reciprocate in the direction A1 (fore-and-aft direction) via the connecting arm 31, the ball joint 29, the drive arm 25, and the supporting arm 26, and thus the therapeutic members 8, 9 make a rapping movement. Since one of the eccentric shaft portions 20A is off-centered in the opposite direction from the other one, the therapeutic members 8, 9 on the left side and the right side make rapping motion alternately.

On the other hand, when the kneading motion shaft 19 receives a rotational power, the inclined shaft portion 19A

rotates along a conical surface, and thus the drive arm 25 reciprocates with the ball joint 29 as a fulcrum, and consequently, the therapeutic members 9 on the left side and the right side make reciprocated pivotal movement in the direction of B1 (in the lateral direction) so as to move toward and away from each other.

The mechanism to select one of the kneading motion shaft 19 and the rapping motion shaft 20 is constructed for example as shown in Fig. 7.

In Fig. 7, a screw gear 33 is mounted on the rapping motion shaft 20, and a worm gear 34 is mounted on the kneading motion shaft 19. There is provided a guide shaft 35 vertically extending in front of, or behind the rapping motion shaft 20 and the kneading motion shaft 19, and a screw gear 36 to be engaged with the screw gear 33 and a worm 37 to be engaged with the worm gear 34 are rotatably provided on the guide shaft 35.

On the end surfaces of the screw gear 36 and of the worm 37 on the guide shaft 35 facing toward each other, there are formed engagement tooth portions 36A, 37A that serve as clutches respectively. The guide shaft 35 is formed with a trapezoidal screw thread 39 on the portion between the screw gear 36 and the worm 37, on which a movable helical gear 40 is mounted in engagement with its inner surface. The both end surfaces of the movable helical gear 40 is formed with engagement tooth portions 40A, 40A to be engaged with and

disengaged from the engagement tooth portions 36A, 37A. A rotating drive shaft 43 is provided in parallel with the guide shaft 35, and the rotating drive shaft 43 is adapted to be switched to rotate in the directions shown by the arrows P or Q by the massage motor 10 via a pulley or a belt.

A helical gear 44 is mounted on the rotating drive shaft 43 and engaged with the helical thread on the outer surface of the movable helical gear 40, so that when the rotating drive shaft 43 rotates in the direction P, the movable helical gear 40 in engagement with the helical gear 44 rotates and moves along the trapezoidal screw thread 39 of the guide shaft 35 in the direction R, and the engagement tooth portion 40A of the movable helical gear 40 engages with the engagement tooth portion 36A of the screw gear 36 to rotate the screw gear 36. As a consequence, the rapping motion shaft 20 provided with the screw gear 33 to be engaged with the screw gear 36 rotates in the direction A. In contrast to it, when the rotating drive shaft 43 is rotated in the direction Q, which is the opposite direction from the direction P, the movable helical gear 40 moves in the direction S, which is the opposite direction from the direction R, and engages with the worm 37 to rotate the kneading motion shaft 19 in the direction B.

Accordingly, when the rotating drive shaft 43 is rotated in the forward or reverse direction to move the movable helical gear 40 selectively in one of the directions R and S, one of

the rapping motion shaft 20 and the kneading motion shaft 19 is rotated to perform rapping motion or kneading motion with a plurality of therapeutic members 8, 9. Since the screw gears 33, 36 have almost the same number of teeth, rapping motion is performed relatively many times per unit time, but kneading motion is performed slowly since the turning effort is transmitted from the worm 37 to the worm gear 34 with significant speed reduction.

As shown in Fig. 1, Fig. 2, and Fig. 5, each drive arm 25 comprises a pair of left and right clipping bodies 51, and the midsection of the supporting arm 26 is pivotally connected to the tip portion of the drive arm 25 about the lateral axis (corresponding to the center of connection O1 described later) by clipping the midsection of the supporting arm 26 between the tip portions of the left and the right clipping bodies 51 and tightening the bolt and nut 48 inserted through the supporting arm 26 and the pair of clipping bodies 51.

As shown in Fig. 3, lateral supporting shafts 49 are fixed to the upper and the lower end portions of the supporting arm 26 by crimping or the like, and the first therapeutic member 8 or the second therapeutic member 9 is rotatably fitted with the supporting shafts 49 and being prevented from coming off by the nut 50 engaged with the external thread portion 49a of the supporting shaft 49. In this arrangement, the first therapeutic member 8 is mounted to one end portion (upper end

portion) of the supporting arm 26 so as to rotate about the lateral axis (corresponding to the first center of mounting O2 described later) and the second therapeutic member 9 is mounted to the other end portion (lower end portion) of the supporting arm 26 so as to rotate about the lateral axis (corresponding to the second center of mounting O3 described later), so that the power is transmitted to the therapeutic members 8, 9 through the drive arm 25 and the supporting arm 26 to allow each therapeutic member 8, 9 to perform massaging motion by kneading motion or rapping motion.

A pair of the right and left supporting arms 26 are leaf springs (spring plates) formed of spring steel or the like in the shape of boomerang, and as shown in Fig. 5 and Fig. 8, arranged in the seatback portion 4 with the surfaces faced toward the left and the right sides to accommodate the resilient deformation in the left and the right directions.

As shown in Fig. 1, Fig. 2, and Fig. 9 through Fig. 12, a spring pin 53 and a stopper 54 are provided on each supporting arm 26 projecting therefrom, and the pivotal movement of the supporting arm 26 with respect to the drive arm 25 is limited to the range from the lower pivotal position a in which the spring pin 53 abuts against the drive arm 25 as shown by the supporting arm 26 in a solid line in Fig. 1 to the upper pivotal position b in which the stopper 54 abuts against the drive arm 25 as shown by the supporting arm 26 in the dashed lines in

Fig. 1. A tension spring 55 is provided between the spring pin 53 of the supporting arm 26 and the spring pin 52 of the drive arm 25, so that the tension spring 55 urges the supporting arm 26 in the direction shown by the arrow *c* shown in Fig. 1 (toward the lower pivotal position a).

As shown in Fig. 2 and Fig. 1, the pair of left and right clipping bodies 51 of the drive arm 25 are provided with through holes 56 extending therethrough in the lateral direction. The through hole 56 formed on one of the clipping bodies 51 is provided with a light emitting element (light emitting diode) 57 and the through hole 56 formed on the other one of the clipping bodies 51 is provided with a light receiving element (light receiving transistor) 58. The light emitting element 57 illuminates light toward the light receiving element 58, so that the light receiving element 58 is turned on when it received light from the light emitting element 57 and turned off when light from the light emitting element 57 is blocked by the supporting arm 26. The optical sensor having the light emitting element 57 and the light receiving element 58 constitutes a pivotal movement detecting sensor 60 for detecting that the supporting arm 26 reached a prescribed range of pivotal movement with respect to the drive arm 25.

When the supporting arm 26 is moved vertically along the user's body together with the drive arm 25 by moving the massaging unit 7 upward and downward with the first therapeutic

member 8 and the second therapeutic member 9 abutted against the user, and the first therapeutic member 8 reaches the position of the user's shoulder or the neck as shown in Fig. 8, the supporting arm 26 pivots significantly in the direction shown by the arrow c in Fig. 1 (toward the lower pivotal position a) with respect to the drive arm 25, and simultaneously, the supporting arm 26 being away from between the light emitting element 57 and the light receiving element 58 as shown by the dashed lines in Fig. 1 pivots toward the lower pivotal position a as shown by a solid line and blocks light between the light emitting element 57 and the light receiving element 58, so that the pivotal movement detecting sensor 60 detects that the supporting arm 26 reached the prescribed range of pivotal movement with respect to the drive arm 25.

Each of the pair of left and right supporting arms 26 bent into the shape of boomerang is bent into a relatively steep angle as shown in Fig. 12, and in this embodiment, for example, the relative dimensions (mm) among the center of connection of the supporting arm 26 with respect to the drive arm 25, the center of mounting of the supporting arm 26 with respect to the first therapeutic member 8, the center of mounting the supporting arm 26 with respect to the second therapeutic member 9, the position of the spring pin 53 projected therefrom, and the position of the stopper 54 projected therefrom are determined as shown in Fig. 12. The diameters of the second

therapeutic member 9 and the first therapeutic member 8 are respectively determined to approximately 70 mm.

The bent form of each supporting arm 26 is determined as shown in Fig. 9, Fig. 10, and Fig. 11. The reason why the supporting arm 26 is formed into the shape of steeply bent boomerang is that this shape is found to be the shape to perform the most preferable massaging motion as a result of biotechnological verification. The shape of the arm, which may seem to be eccentric having a radical shape, is obtained by investigating a locus that thoroughly traces the shape of the back of the human assumed to be sitting on a chair type massaging apparatus.

In other words, as shown in Fig. 9, when the center of connection of the supporting arm 26 with respect to the drive arm 25 is designated as the center of connection O1, the center of mounting of the supporting arm 26 with respect to the first therapeutic member 8 as the first center of mounting O2, the center of mounting of the supporting arm 26 with respect to the second therapeutic member 9 as the second center of mounting O3, the line segment between the first center of mounting O2 and the second center of mounting O3 as the end-to-end connecting line A, the line segment between the first center of mounting O2 and the center of connection O1 as the first center-to-center connecting line B, the contact point at which the parallel line D in parallel with the end-to-end connecting

line A touches the inner edge 26a of the supporting arm 26 as the inner contact point P, and the line segment connecting the first center of mounting O2 with the inner contact point P as the line segment E, the supporting arm 26 is bent so that the angle θ1 formed between the end-to-end connecting line A and the line segment E becomes larger than the angle θ2 formed between the first center-to-center connecting line B and the line segment E, and the distance between the center of connection O1 and the first center of mounting O2 is determined to be almost the same as the distance between the center of connection O1 and the second center of mounting O3.

As show in Fig. 10, when the center of connection of the supporting arm 26 with respect to the drive arm 25 is designated as the center of connection O1, the line segment of the tangent line passing through the center of connection O1 and touching the first therapeutic member 8 on the side of the inner edge 26a of the supporting arm 26 as the first inner tangent line F, and the line segment of the tangent line passing thorough the center of connection O1 and touching the second therapeutic member 9 on the side of the inner edge 26a of the supporting arm 26 as the second inner tangent line G, the supporting arm 26 is bent in such a manner that the angle θ3 between the first inner tangent line F and the second inner tangent line G forms an acute angle.

As shown in Fig. 11, when the center of mounting of the

supporting arm 26 with respect to the first therapeutic member 8 is designated as the first center of mounting O2, the center of mounting of the supporting arm 26 with respect to the second therapeutic member 9 as the second center of mounting O3, the line segment connecting between the first center of mounting O2 and the second center of mounting O3 as the end-to-end connecting line A, the contact point at which the parallel line D in parallel with the end-to-end connecting line A touches the inner edge 26a of the supporting arm 26 as the inner contact point P, the line segment of the tangent line passing through the inner contact point P and touching the first therapeutic member 8 on the side of the inner edge 26a of the supporting arm 26 as the first tangent line from the inner contact point I, and the line segment of the tangent line passing through the inner contact point P and touching the second therapeutic member 9 on the side of the inner edge 26a of the supporting arm 26 as the second tangent line from the inner contact point J, the supporting arm 26 is bent in such a manner that the angle θ4 between the first tangent line from the inner contact point I and the second tangent line from the inner contact point J forms generally a right angle.

The construction of the control system of the massaging apparatus 1 will now be described. The pivotal movement detecting sensor 60 detects that the supporting arm 26 reached the prescribed range of pivotal movement with respect to the

drive arm 25, and the detected signal obtained here is fed to the control unit constructed of a microcomputer or the like, which is not shown in the figure. The pivotal movement detecting sensor 60 may be provided as one pair each for the left and right pairs of supporting arms 26 and the drive arms 25, or one for one of the left and right pairs of the supporting arms 26 and the drive arms 25.

As shown in Fig. 8, there are provided an upper limit switch S1 at the uppermost position of the vertical movement of the massaging unit 7 (supporting arm 26), and a lower limit switch S2 at the lowermost position thereof, so that the massaging unit 7 is controlled to move vertically between the uppermost position and the lowermost position by the control unit, not shown. The vertical position of the massaging unit 7 or the supporting arm 26 is detected from the number of revolution of the hoist motor 16 and fed to the control unit.

The control unit constructed of a microcomputer or the like is adapted to control the massage motor 10 and the hoist motor 16 according to the procedure of the program of the automatic course.

The control unit is adapted to reciprocate, as an initial action when the automatic course is selected, the massaging unit 7 vertically along the user's body with the first therapeutic member 8 and the second therapeutic member 9 abutted against the user (to perform a rolling motion with the

massaging unit 7), and to determine the position of the specific portion of the user's body, or the position of the shoulder with respect to the massaging apparatus 1 from the relation between the vertical position of the massaging unit 7 and the pivotal position detected by the pivotal movement detecting sensor 60. In other words, the position of the specific portion of the user's body with respect to the massaging apparatus is determined from the vertical position of the supporting arm 26 at the moment when the pivotal movement of the supporting arm 26 reached the prescribed range.

More specifically, the massaging unit 7 is moved vertically with the first therapeutic member 8 and the second therapeutic member 9 abutted against the user to move the supporting arm 26 and the drive arm 25 vertically along the user's body. When the first therapeutic member 8 reaches the position of the shoulder or the neck of the user as shown in Fig. 8, the supporting arm 26 pivots significantly toward the lower pivotal position a with respect to the drive arm 25, and simultaneously, the supporting arm 26 that has been out of the position between the light emitting element 57 and the light receiving element 58 as shown by the dashed lines in Fig. 1 pivots toward the lower pivotal position a shown by a solid line to block between the light emitting element 57 and the light receiving element 58, and thus the pivotal movement detecting sensor 60 is turned from ON to OFF and detects that

the supporting arm 26 reached the prescribed range of pivotal movement with respect to the drive arm 25. The signal detected by the pivotal movement detecting sensor 60 is fed to the control unit, so that the control unit determines the shoulder position of the user (the position of the specific portion of the user) with respect to the massaging apparatus from the vertical position of the supporting arm 26 (massaging unit 7) at this moment.

The term "rolling motion" here means the effective massaging motion that the therapeutic members 8 and 9 stimulate the vertical linear portion so called meridian along which the meridian points, or the pressure points, are aligned at intervals of about 70 mm on the back along the backbone of the human body. Therefore, it generally means a massaging motion that is considered to be preferable when it is made prior to the kneading and rapping motion.

According to the embodiment described thus far, since each of the pair of left and right supporting arms 26 is bent at a relatively steep angle into a shape of boomerang, in which the angle $\theta 1$ formed between the end-to-end connecting line A and the line segment E is larger than the angle $\theta 2$ formed between the first center-to-center connecting line B and the line segment E as shown in Fig. 9, the angle $\theta 3$ formed between the first inner tangent line F and the second inner tangent line G forms an acute angle as shown in Fig. 1, and the angle $\theta 4$

formed between the first tangent line I from the inner contact point and the second tangent line J from the inner contact point forms generally a right angle as shown in Fig. 11, when massaging the shoulder or the neck by the first therapeutic member 8, even when the second therapeutic member 9 abuts against the back, the first therapeutic member 9 approaches toward the shoulder or the neck to a large amount as shown in Fig. 8 and thus the first therapeutic member 8 can massage the shoulder or the neck of the user satisfactorily on a deeper position with a relatively strong force.

As shown in Fig. 8, when massaging the hip of the user by the second therapeutic member 9 with the massaging unit 7 moved downward to lower the supporting arm 26 to the lowermost position, the first therapeutic member 8 abuts against the upper portion of the user's hip and thus the amount of projection of the second therapeutic member 9 toward the body increases. Therefore, the second therapeutic member 9 can press the hip of the user with a sufficiently strong force, thereby realizing more effective massage on the user's hip by the second therapeutic member 9. As a consequence, this massaging apparatus can perform massaging motion on the upper half of the user's body including the shoulder, back, hip, and the like thoroughly and satisfactorily.

According to the embodiment described above, when the massaging unit 7 is moved vertically along the user's body,

the first therapeutic member 8 and the second therapeutic member 9 of the pair of the left and the right supporting arms 26 move vertically in a state of being abutted against the shoulder, back, hip, and the like of the user. Then, when the first therapeutic member 8 reaches the position corresponding to the user's shoulder or the neck by the upward movement of the massaging unit 7, the first therapeutic member 8 advances through the side of the user's back above the shoulder or beside the neck as shown in Fig. 8, and the supporting arm 26 pivots significantly toward the lower pivotal position a with respect to the drive arm 25 as described above.

At this time, as shown by the dashed lines in Fig. 1, the supporting arm 26 having been out of the position between the light emitting element 57 and the light receiving element 58 blocks transmission of light between the light emitting element 57 and the light receiving element 58 as shown by the solid line, and thus the light receiving element 58 is turned from ON to OFF, so that the pivotal movement detecting sensor 60 detects that the supporting arm 26 reached the prescribed range of pivotal movement with respect to the drive arm 25 easily and reliably. The vertical position of the supporting arm 26 (the vertical position of the massaging unit 7) at this moment is recorded in the control unit or the like as the position of the user's shoulder with respect to the massaging apparatus, so that the control unit, which is not shown in the

figure, determines the position of the specific portion of the user, or the shoulder position, with respect to the massaging apparatus accurately from the relation between the vertical position of the supporting arm 26 (the vertical position of the massaging unit 7) and the pivotal position of the supporting arm 26.

As is described thus far, by determining the shoulder position of the user with respect to the massaging apparatus accurately, the position of the desired portion of the user's body can accurately be calculated for example from the user's shoulder position, whereby the first therapeutic member 8 or the second therapeutic member 9 can be moved accurately to the desired position to perform a massaging motion accurately thereon, and thus the automatic massaging course for example enables further effective massage. In case of stimulating pressure points, which is well on its way to becoming a boom recent years, the pressure points can be determined accurately to some extent from the shoulder position of the user, whereby massage by stimulating the pressure points can effectively be performed.

The embodiment described above is constructed in such a manner that when the supporting arm 26 is moved in the opposite direction to the direction shown by the arrow c in Fig. 1 with respect to the drive arm 25 (toward the upper pivotal position b), the supporting arm 26 is out of the position between the

light emitting element 57 and the light receiving element 58 so as not to block the transmission of light between the light emitting element 57 and the light receiving element 58, and when the supporting arm 26 is moved in the direction shown by the arrow c in Fig. 1 with respect to the drive arm 25 (toward the lower pivotal position a), the supporting arm 26 blocks the transmission of light between the light emitting element 57 and the light receiving element 58 to turn the pivotal movement detecting sensor 60 from ON to OFF, so that the pivotal movement detecting sensor 60 detects that the supporting arm 26 reached the prescribed range of pivotal movement with respect to the drive arm 25. Alternatively, it is also possible to change the position to mount the light emitting element 57 and the light receiving element 58 with respect to the drive arm 25 to construct the massaging apparatus in such a manner that when the supporting arm 26 is rotated in the direction opposite to the direction shown by the arrow c in Fig. 1 with respect to the drive arm 25 (toward the upper pivotal position b), the supporting arm 26 blocks the transmission of light between the light emitting element 57 and the light receiving element 58, and when the supporting arm 26 is moved in the direction shown by the arrow c in Fig. 1 with respect to the drive arm 25 (toward the lower pivotal position a), the supporting arm 26 comes out of the position between the light emitting element 57 and the light receiving element 58 to turn

the pivotal movement detecting sensor 60 from OFF to ON, so that the pivotal movement detecting sensor 60 detects that the supporting arm 26 reached the prescribed range of pivotal movement with respect to the drive arm 25.

Fig. 13 and Fig. 14 show another embodiment, in which the clipping body 51 on one of the drive arms 25 is formed with a through hole 56 so as to extend therethrough in the lateral direction, and a limit switch 63 including a micro switch or the like integrated therein is mounted within the through hole 56, so that the limit switch 63 constitutes the pivotal movement detecting sensor 60. When the massaging unit 7 is moved vertically to move the supporting arm 26 vertically along the user's body together with the drive arm 25 with the first therapeutic member 8 and the second therapeutic member 9 abutted against the user, and the first therapeutic member 8 reaches the shoulder or the neck position of the user, the supporting arm 26 pivots significantly in the direction shown by the arrow c with respect to the drive arm 25 (toward the lower pivotal position a), and simultaneously, the supporting arm 26 having been away from the limit switch 63 as shown by the dashed lines in Fig. 14 presses the limit switch 63 as shown by a solid line to turn the limit switch 63 from OFF to ON, so that the pivotal movement detecting sensor 60 detects that the supporting arm 26 reached the prescribed range of pivotal movement with respect to the drive arm 25. Other features are

the same as the embodiment described above.

Fig. 15 and Fig. 16 show another embodiment, in which a magnet 65 is mounted on the supporting arm 26, and a lead switch 66 is mounted on the clipping body 51 of one of the drive arms 25 correspondingly, so that the lead switch 66 constitutes the pivotal movement detecting sensor 60. In this case, when the massaging unit 7 is moved vertically to move the supporting arm 26 vertically along the user's body together with the drive arm 25 with the first therapeutic member 8 and the second therapeutic member 9 abutted against the user, and the first therapeutic member 8 reaches the shoulder or the neck position of the user, the supporting arm 26 pivots significantly toward the lower pivotal position a with respect to the drive arm 25, and simultaneously, the magnet 65 on the supporting arm 26 being away from the lead switch 66 on the drive arm 25 as shown by the dashed lines in Fig. 16 approaches the lead switch 66 on the drive arm 25 as shown by a solid line to turn the lead switch 66 from OFF to ON, so that the pivotal movement detecting sensor 60 detects that the supporting arm 26 reached the prescribed ranges of pivotal movement with respect to the drive arm 25. Other features are the same as the embodiment described above.

While the pivotal movement detecting sensor 60 is constructed of the lead switch 66 in the embodiment shown in Fig. 15 and Fig. 16, it is also possible to construct the pivotal movement detecting sensor 60 in such a manner that a

magnetoelectric converting element (magnetic sensor) such as a Hall element, a magnet resistance element, a magnetic diode, or a magnetic transistor is provided instead of the lead switch 66 on one of the clipping bodies 51 so as to correspond to the magnet 65, so that the magnetoelectric converting element is switched between ON and OFF or the detected signal (current value or voltage value) outgoing from the magnetoelectric converting element varies according to the change of the magnetic field when the supporting arm 26 reached the prescribed range of pivotal movement with respect to the drive arm 25.

In the embodiment shown in Fig. 13 and Fig. 14 or the embodiment shown in Fig. 15 and the Fig. 16, the pivotal movement detecting sensor 60 is constructed of the limit switch 63 or the lead switch 66 so as to detect that the supporting arm 26 reached the prescribed range of pivotal movement when the limit switch 63 or the lead switch 66 is switched from OFF to ON. Alternatively, it is also possible to construct the pivotal movement detecting sensor 60 to detect that the supporting arm 26 reached the prescribed range of pivotal movement when the limit switch 63 or the lead switch 66 is switched from ON to OFF.

Fig. 17 and Fig. 18 show another embodiment, in which the pivotal movement detecting sensor 60 is constructed of a variable resistor 69 in which the resistance varies according

to the pivotal position of the supporting arm 26 with respect to the drive arm 25.

In this embodiment, an outer cylindrical portion 70 of the variable resistor 69 is fixed to the supporting arm 26 via a bracket 71, and a shaft portion 72 of the variable resistor 69 is fixed to the tip portion of one of the clipping bodies 51, so that when the supporting arm 26 pivots with respect to the drive arm 25, the outer cylindrical portion 70 and the shaft portion 72 of the variable resistor 69 make relative rotation about the pivotal axis of the supporting arm 26 (corresponds to the center of connection O1 described above), and the resistance of the variable resistor 69 varies linearly according to the pivotal position of the supporting arm 26 with respect to the drive arm 25, so that the pivotal movement detecting sensor 60 constructed of the variable resistor 69 feeds the detected signal representing the voltage value or the current value corresponding (generally proportional) to the pivotal position of the supporting arm 26 to the control unit constructed of a microcomputer or the like.

Then, during the rolling operation of the massaging unit 7, the control unit determines and stores therein the vertical position of the supporting arm 26 (vertical position of the massaging unit 7) at the moment when the first therapeutic member 8 reached the user's shoulder or neck position and the supporting arm 26 pivoted significantly toward the lower

pivotal position a with respect to the drive arm 25 as the shoulder position of the user with respect to the massaging apparatus from the voltage value or the current value represented by the detected signal fed from the pivotal movement detecting sensor 60, and then the specific portion of the user, or the shoulder position, with respect to the massaging apparatus is determined from the relation between the vertical position of the supporting arm 26 (vertical position of the massaging unit 7) and the pivotal position of the supporting arm 26.

While the pivotal movement detecting sensor 60 is constructed of the variable resistor 69 in the embodiment shown in Fig. 17 and Fig. 18, it is also possible to provide a incremental or absolute rotary encoder instead of the variable resistor 69 at the connecting portion between the supporting arm 26 and the drive arm 25, so that the encoder constitutes the pivotal movement detecting sensor 60. In this case, a detected digital signal corresponding (generally proportional) to the pivotal position of the supporting arm 26 with respect to the drive arm 25 is fed from the encoder to the control unit, so that the position of the specific portion, or the shoulder position, of the user with respect to the massaging apparatus is determined from the relation between the vertical position of the supporting arm 26 (vertical position of the massaging unit 7) and the pivotal

position of the supporting arm 26, as in the case of the above-described variable resistor 69.

In the embodiments described above, the seatback 4 is provided with the pair of left and right supporting arms 26 bent in the boomerang shape, and the pair of left and right drive arms 25 to which the mid sections of the supporting arms 26 are connected. However, the number of the supporting arms 26 of the boomerang shape and of the drive arms 25 are not limited to the pair on the left and the right, but one or more than three supporting arms 26 and the drive arms 25 may be acceptable.

Though the embodiments described above is adapted to determine the shoulder position of the user with respect to the massaging apparatus as the position of the specific portion of the body, the portion of the user is not limited to the shoulder position, it may be other portions. For example, when the supporting arm 26 (therapeutic member) moves vertically on the hip of the user, the supporting arm 26 makes the pivotal movement, which is a bit different from the case where it moves on other portions. Therefore, it is also possible to construct so as to allow the pivotal movement detecting sensor 60 to detect this pivotal movement, and to allow the control unit to determine the hip position of the user with respect to the massaging apparatus, thereby determining the hip position of the user with respect to the massaging apparatus accurately.

While the tension spring 55 is provided between the supporting arm 26 and the drive arm 25 so that the supporting arm 26 is urged in the direction shown by the arrow c (toward the lower pivotal position a) by the tension spring 55 in the embodiments described above, the tension spring 55 may be omitted or may be the tension spring 55 with a very small spring constant instead. In other words, since the supporting arm 26 is formed into a boomerang shape bent to a large extent as shown in Fig. 1 to Fig. 5, the weight balance between the side of the first therapeutic member 8 and the side of the second therapeutic member 9 of the supporting arm 26 with respect to the drive arm 25 is quite good and thus no noise is generated between the supporting arm 26 and the drive arm 25 during rapping motion or the like, whereby the tension spring 55 may be omitted.

While the embodiments described above employs the supporting arm 26 that is bent to a large extent in a boomerang shape, the shape of the supporting arm 26 is not limited thereto, and it may be a plate shaped supporting arm bent into an arch shape as shown in Fig. 19, or may be a rod shaped supporting arm.

While the midsection of the supporting arm 26 is connected to the tip portion of the drive arm 25 so as to pivot about the axis in lateral direction relative to the drive arm 25 in the embodiments described above, the midsection of the

supporting arm 26 may be connected to the tip portion of the drive arm 25 so that the supporting arm 26 and the drive arm 25 pivot together about an axis in the lateral direction instead.

While the pivotal movement detecting sensor 60 is constructed of the optical sensor, the limit switch 63, the lead switch 66, or the variable resistor 69 in the embodiments described above, the pivotal movement detecting sensor 60 may be constructed of an ultrasonic sensor, an infrared sensor, or the like instead. The pivotal movement detecting sensor 60 may be constructed of a linear encoder instead of the rotary encoder.

Since it is proved by experiments that the best massaging motion by kneading motion and rapping motion could be performed for the entire upper half of the body including the back, the hip and the shoulder when the diameters of the first therapeutic member 8 and the second therapeutic member 9 are set to 70 mm, the diameters of the first therapeutic member 8 and the second therapeutic member 9 mounted on both ends of the supporting arm 26 are set to about 70 mm in this embodiment. However, the diameters of the first therapeutic member 8 and the second therapeutic member 9 is not limited to 70 mm, and it may be 60 mm, 75 mm, or other diameters, or the first therapeutic member 8 and the second therapeutic member 9 may be set to have different diameters from each other.

While the supporting arm 26 is provided with the first therapeutic member 8 and the second therapeutic member 9 in the embodiment described above, the number of therapeutic members to be mounted on the supporting arm 26 is not limited to two, and three or more therapeutic members may be mounted on one supporting arm 26. It is also possible to form a therapeutic member in a rod shape and provide only one therapeutic member on the supporting arm 26. The therapeutic member and the supporting arm 26 may be formed into a single unit.

While the present invention is applied to and implemented in the chair type massaging apparatus in the embodiment above, the massaging apparatus to which the present invention is applied is not limited to the chair type massaging apparatus. It may, of course, be applied to and implemented in a bed type or other types of massaging apparatus as far as it is a massaging apparatus having a supporting arm 26. The present invention may be applied to a massaging apparatus for massaging the leg portion of the human body in which the pivotal movement detecting sensor 60 detects the knee position or the ankle position of the user instead of the shoulder position.

[Effect of the Invention]

According to the present invention, the position of the specific portion of the user such as the shoulder position with respect to the massaging apparatus can be automatically and

accurately determined in a simple construction.

[Brief Description of the Drawings]

Fig. 1 is a side view showing a state in which the supporting arm is mounted on a driving arm.

Fig. 2 is a schematic front view in cross-section showing a state in which the supporting arm is mounted on the driving arm.

Fig. 3 is a front view of the supporting arm.

Fig. 4 is a general side view of the massaging apparatus.

Fig. 5 is a perspective view of the massaging unit.

Fig. 6 is a front view showing a part of the massaging apparatus.

Fig. 7 is a perspective view of the transmission mechanism of the massaging unit.

Fig. 8 is a schematic side view showing the massaging apparatus in use.

Fig. 9 is a side view of a supporting arm showing an embodiment of the present invention.

Fig. 10 is a side view of the supporting arm.

Fig. 11 is a side view of the supporting arm.

Fig. 12 is a side view of the supporting arm showing the actual dimensions of each part.

Fig. 13 is a front cross-sectional view of a supporting arm and a driving arm according to another embodiment.

Fig. 14 is a side view of the supporting arm and the

driving arm.

Fig. 15 is a front cross-sectional view of a supporting arm and a driving arm according to another embodiment.

Fig. 16 is a side view of the supporting arm and the driving arm.

Fig. 17 is a front cross-sectional view of a supporting arm and a driving arm according to another embodiment.

Fig. 18 is a side view of the supporting arm and the driving arm.

Fig. 19 is a side view of a supporting arm according to another embodiment.

[Description of the Reference Numerals]

1	chair type massaging apparatus
4	seatback portion
8	first therapeutic member
9	second therapeutic member
25	drive arm
26	supporting arm
60	pivotal movement detecting sensor
61	limit switch
66	lead switch
69	variable registor

[Selected Drawing] Fig. 1

FIG.1

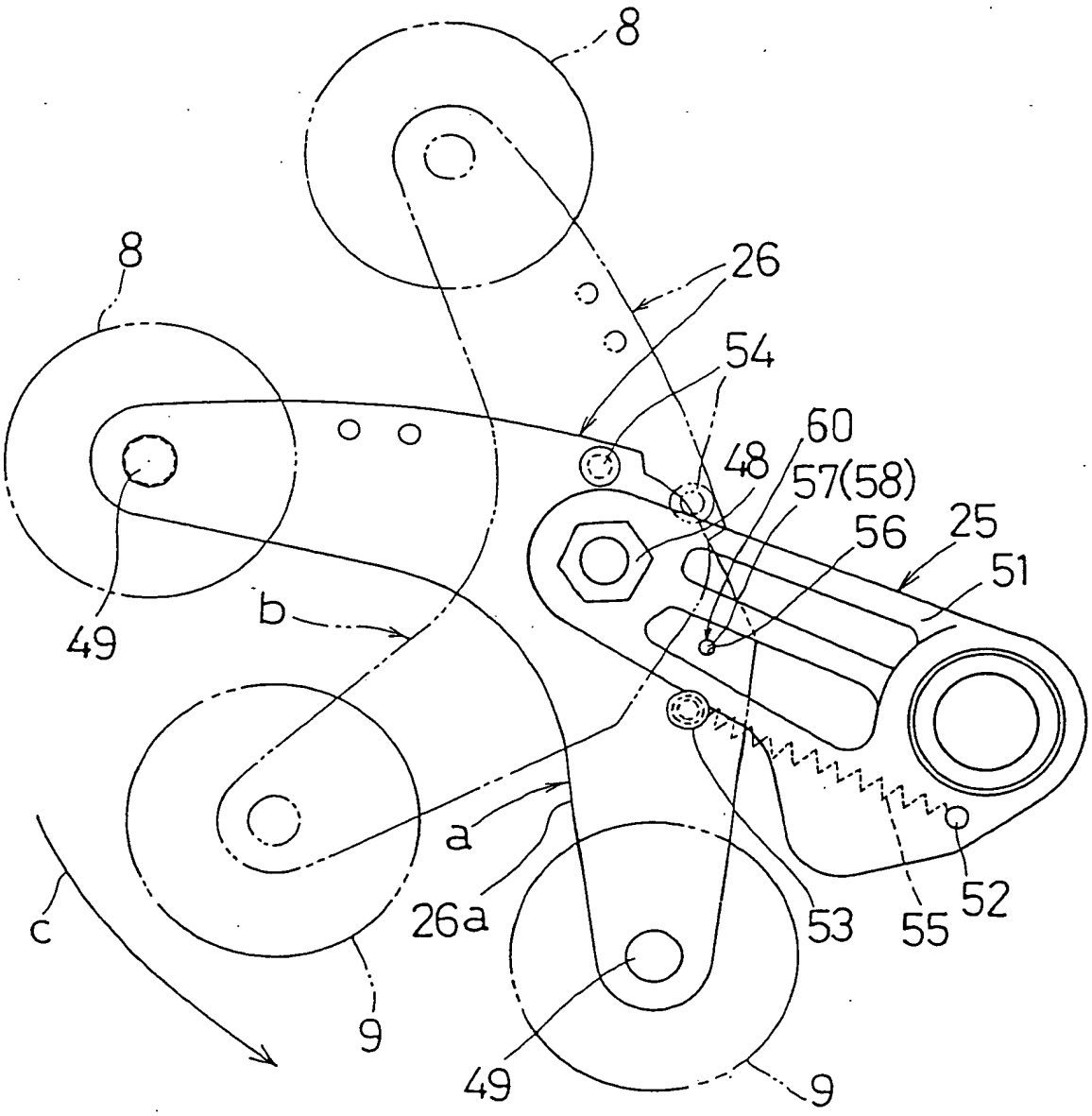


FIG.2

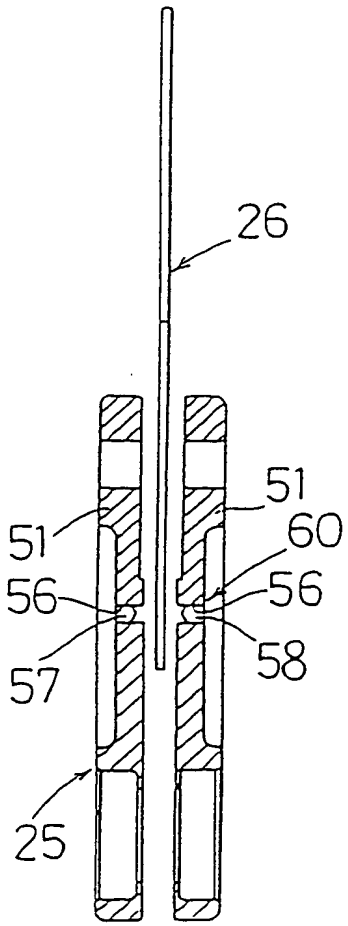
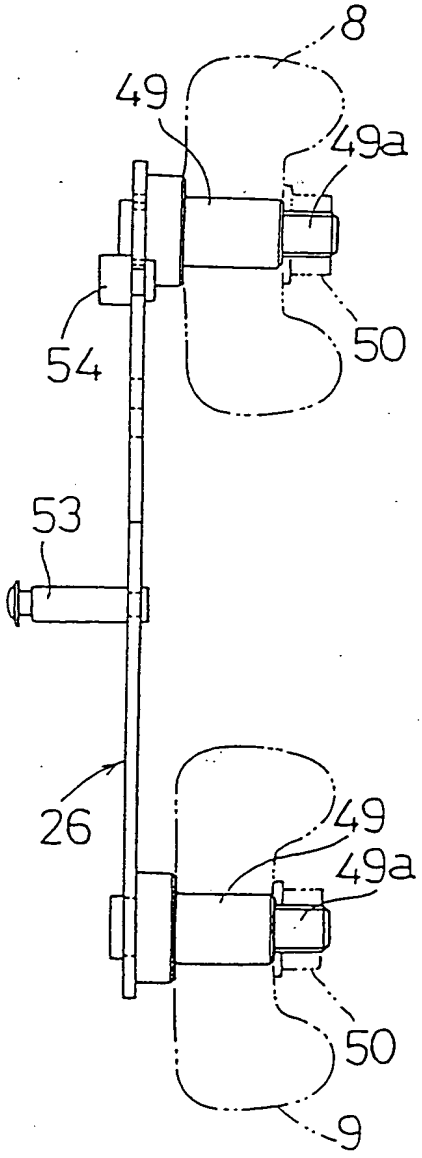


FIG.3



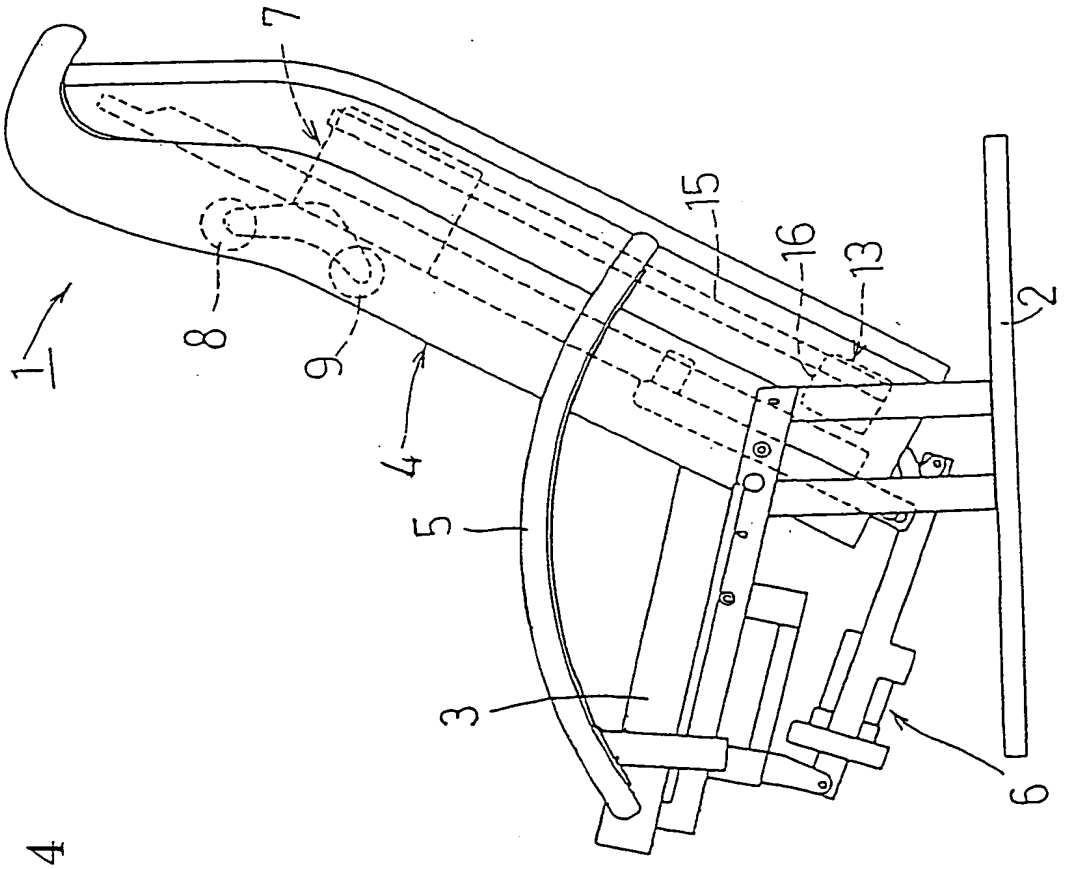


FIG.4

FIG.5

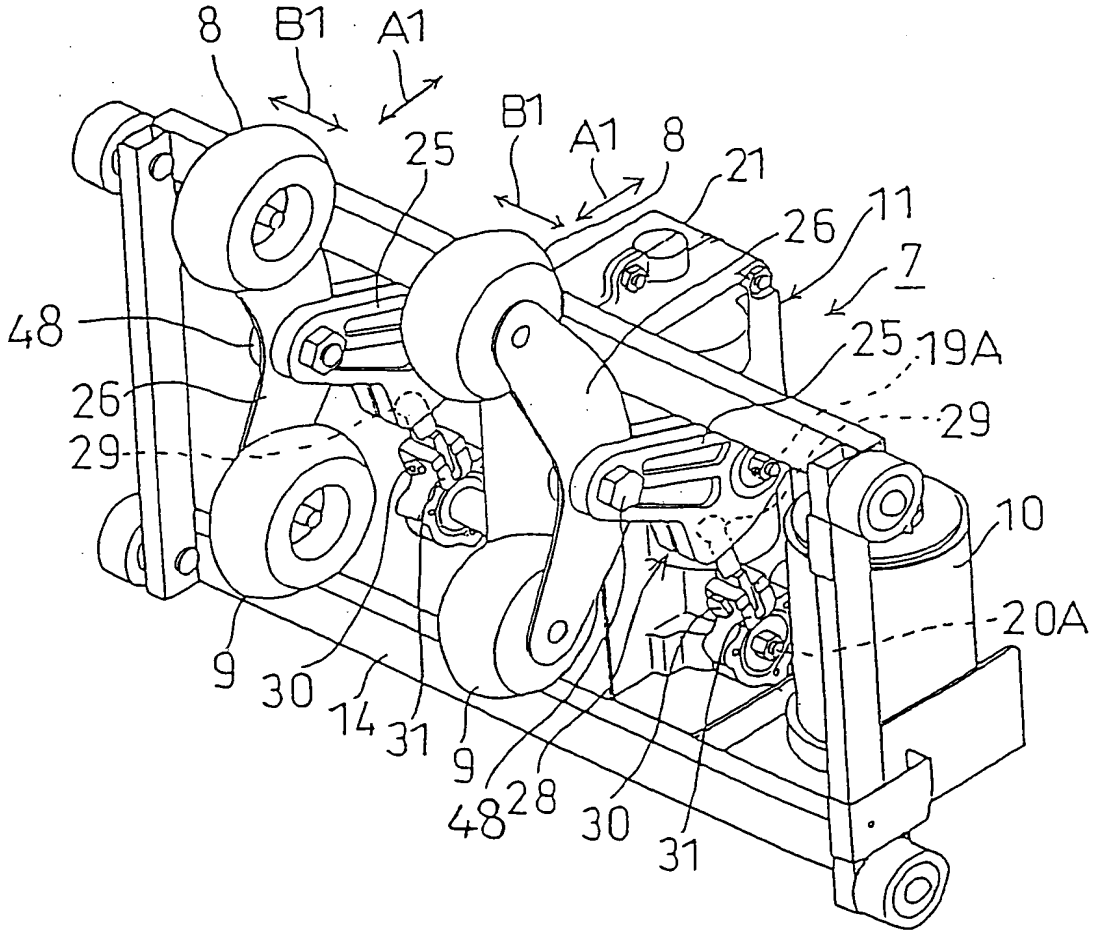


FIG.6

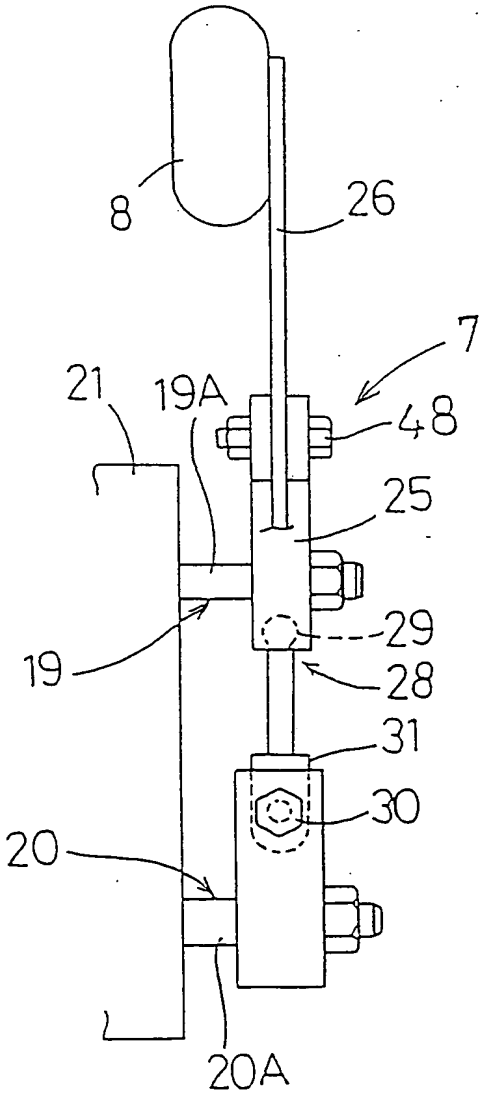


FIG.7

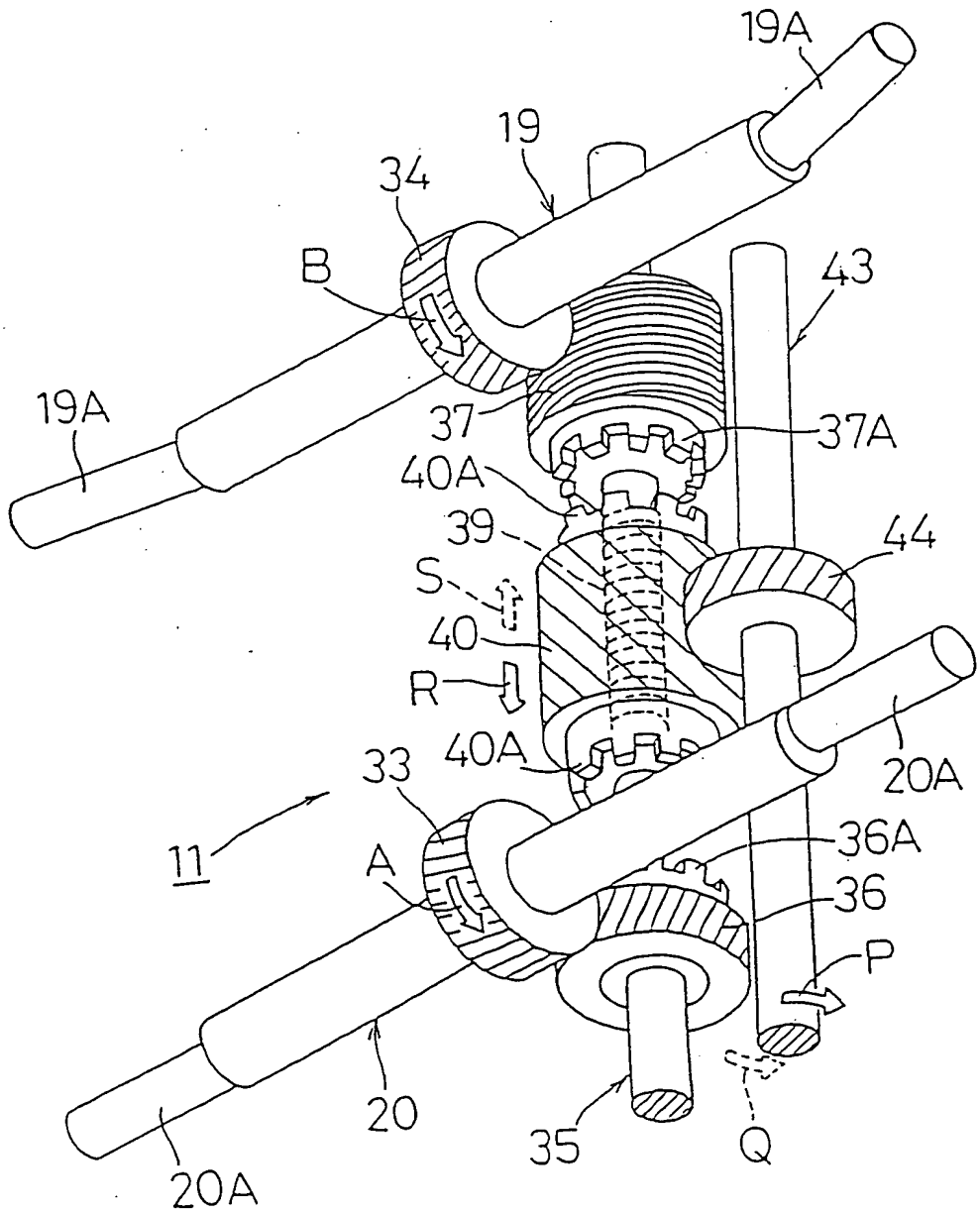


FIG.8

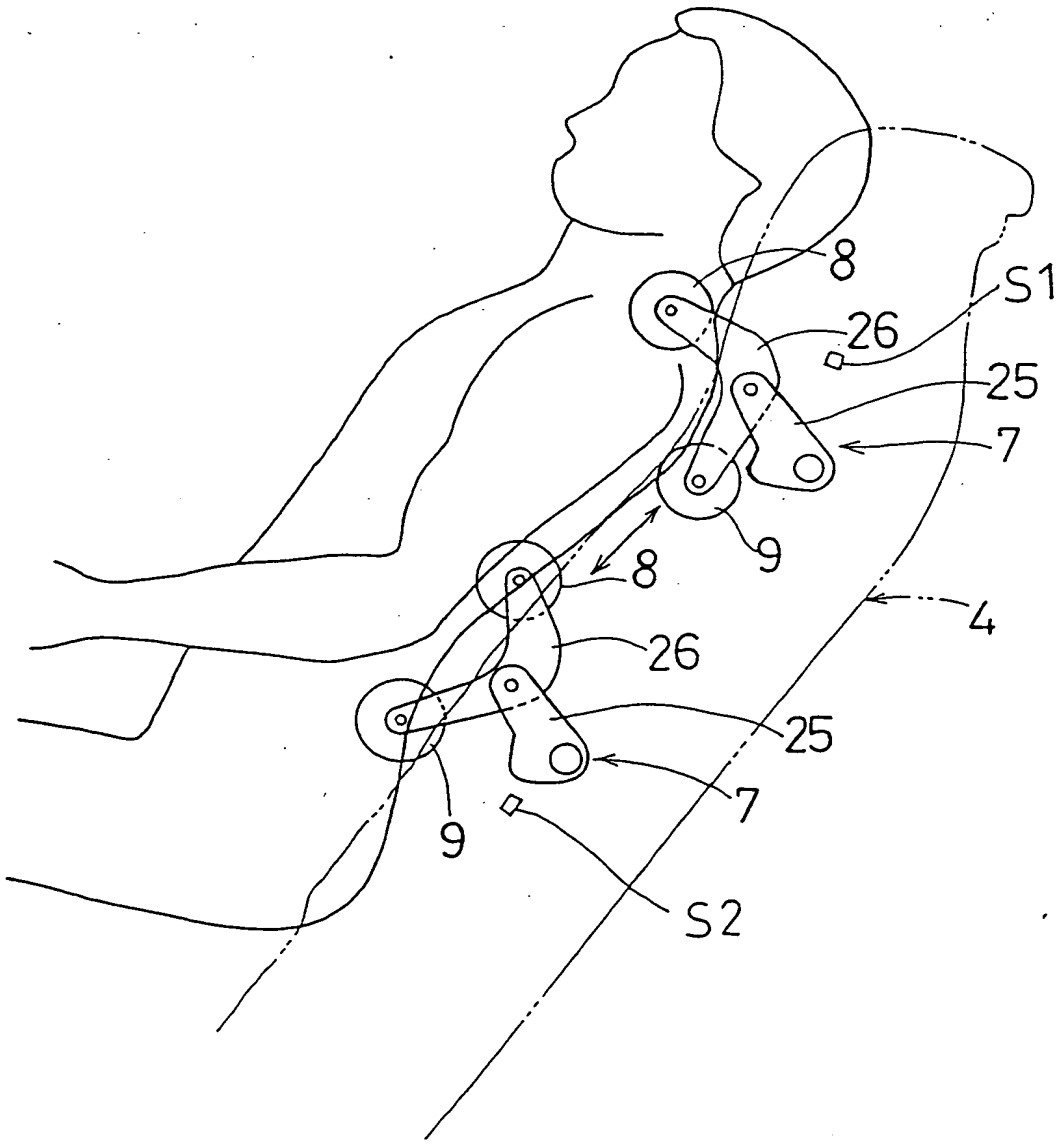


FIG.9

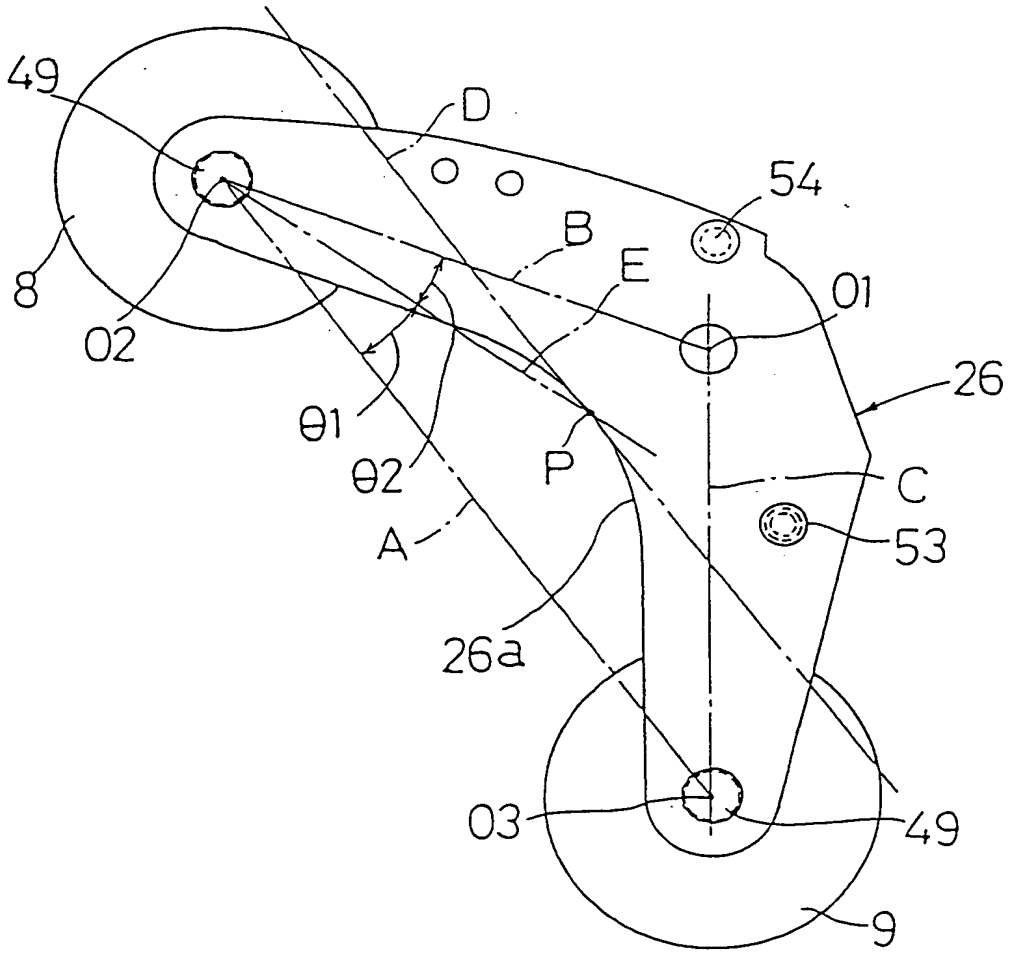


FIG.10

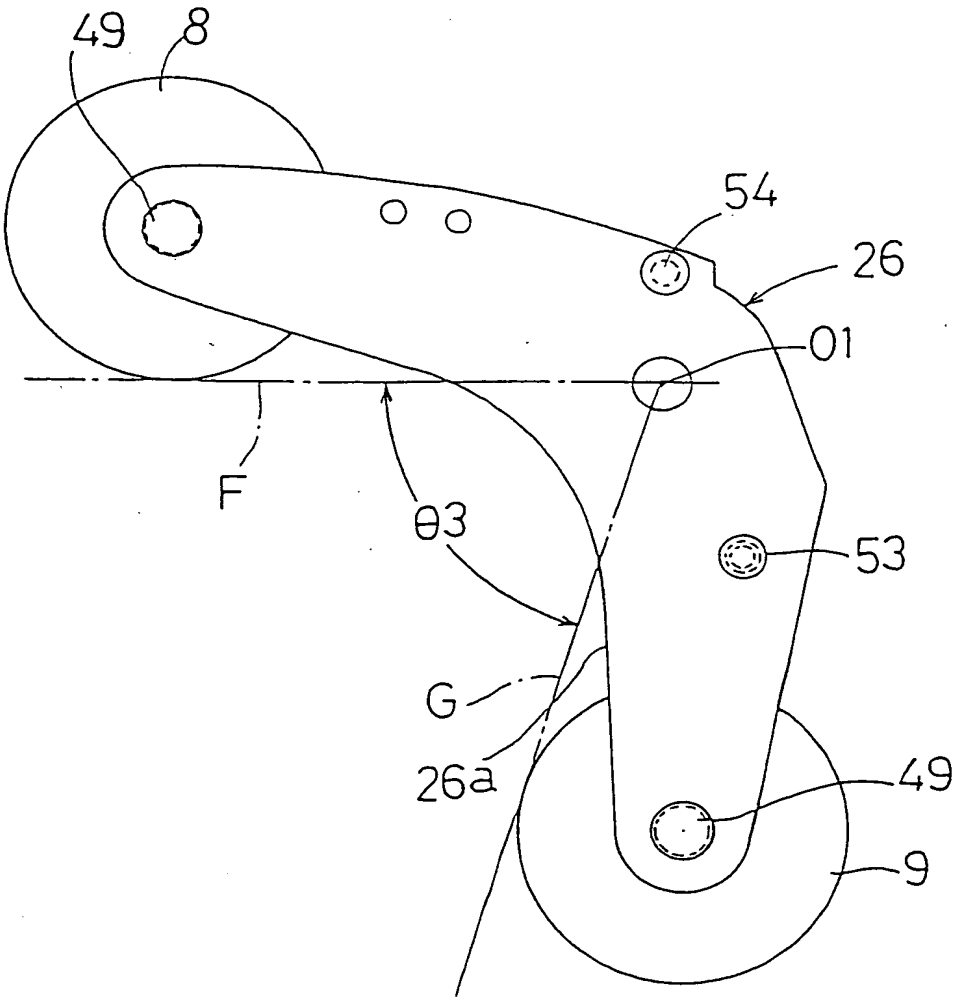


FIG.11

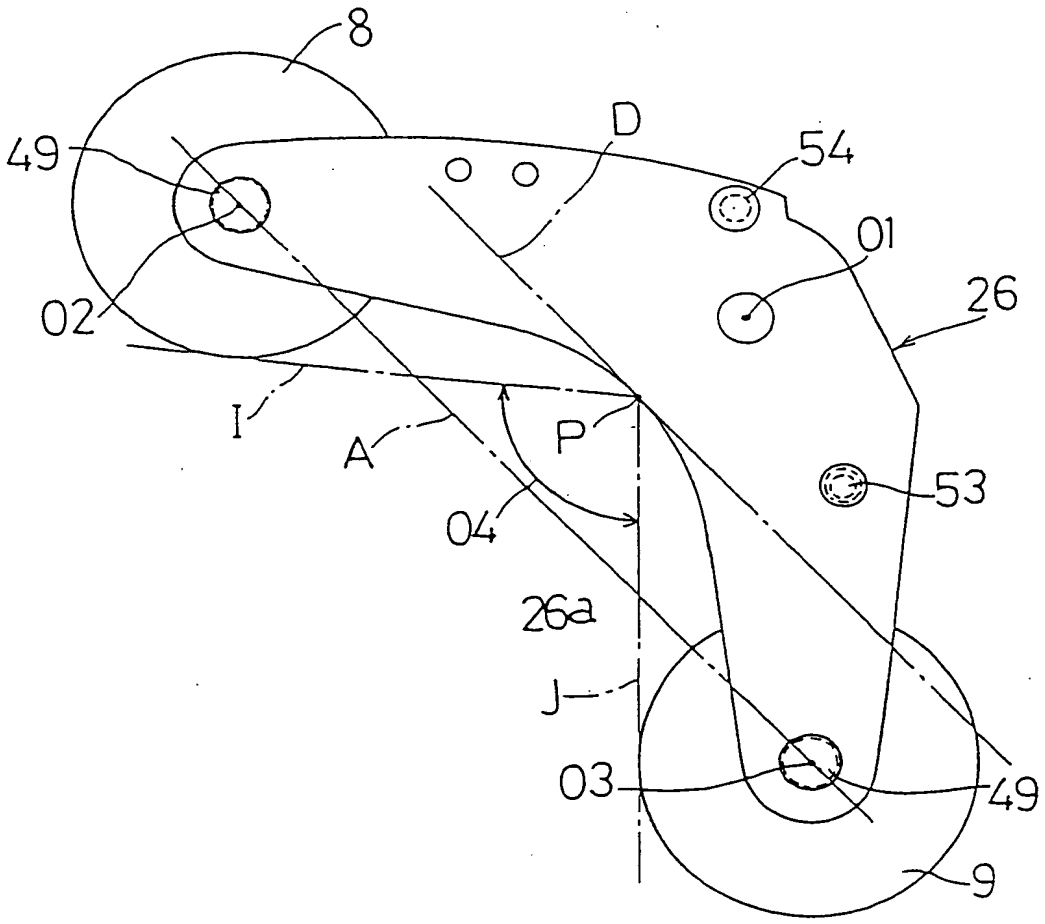


FIG.12

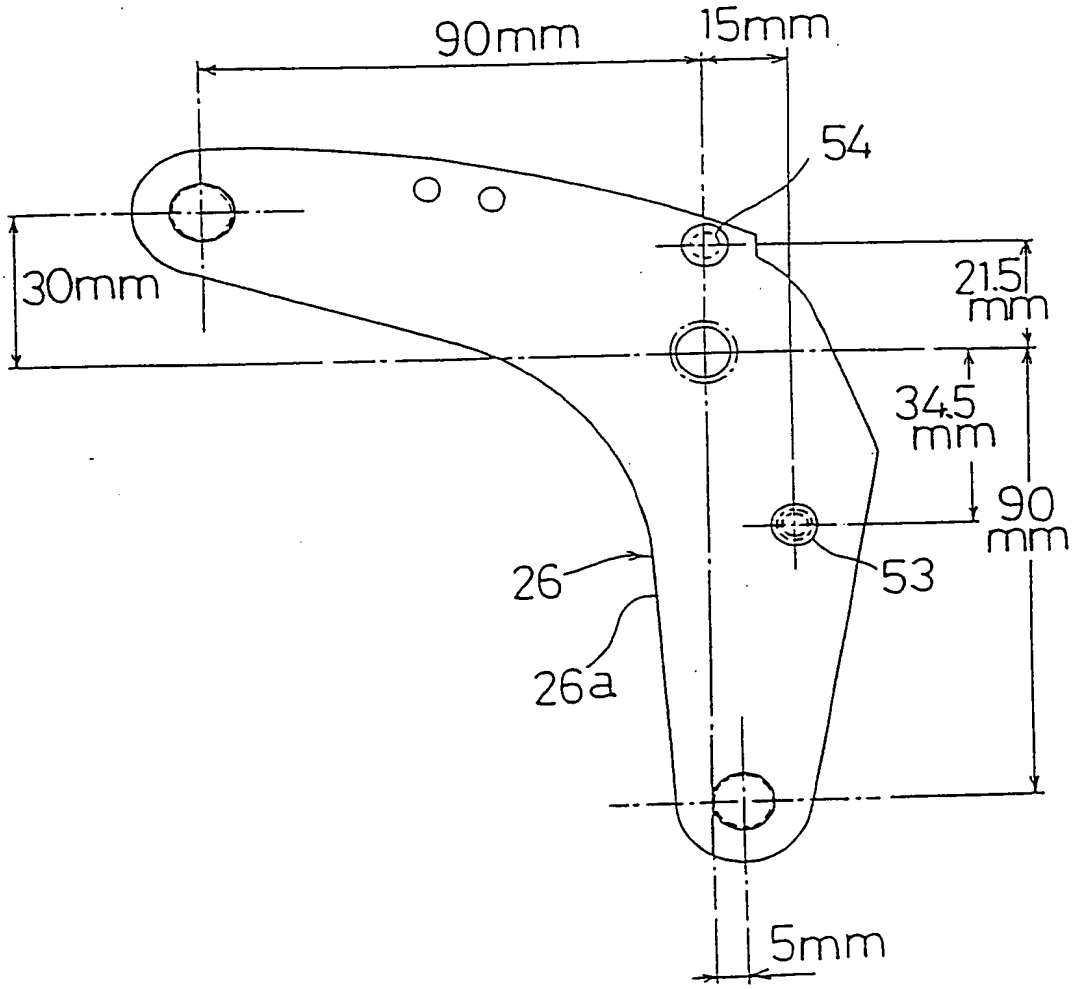


FIG.13

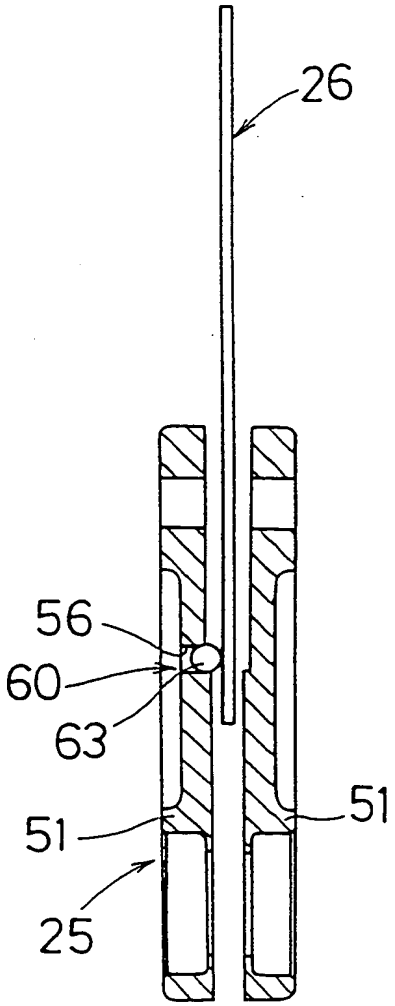


FIG.14

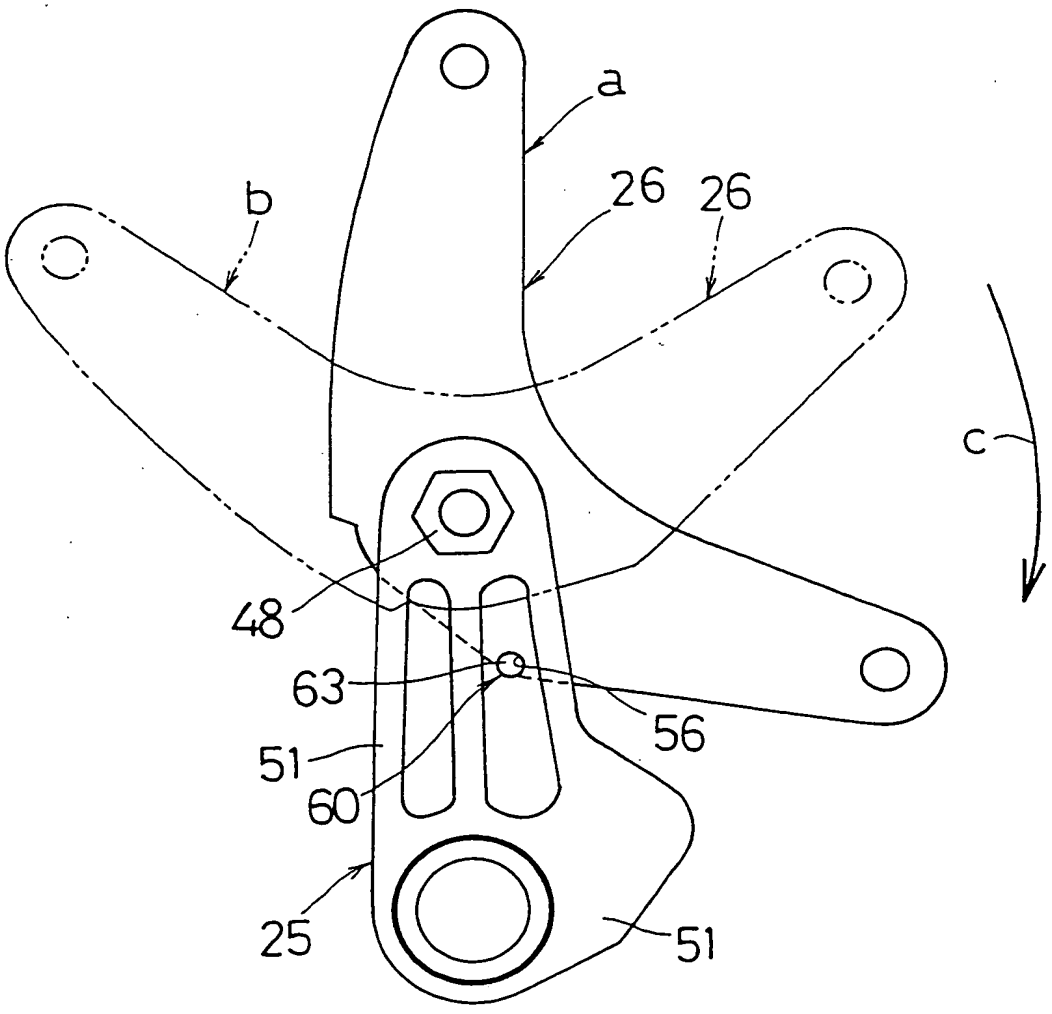


FIG.15

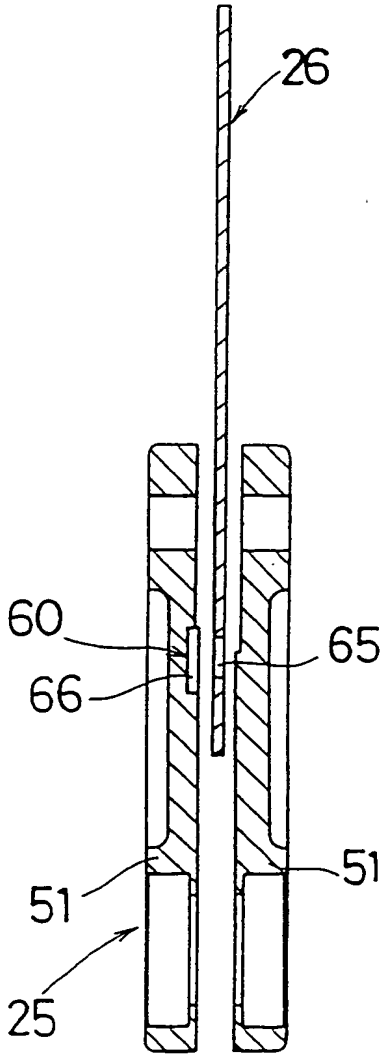


FIG.16

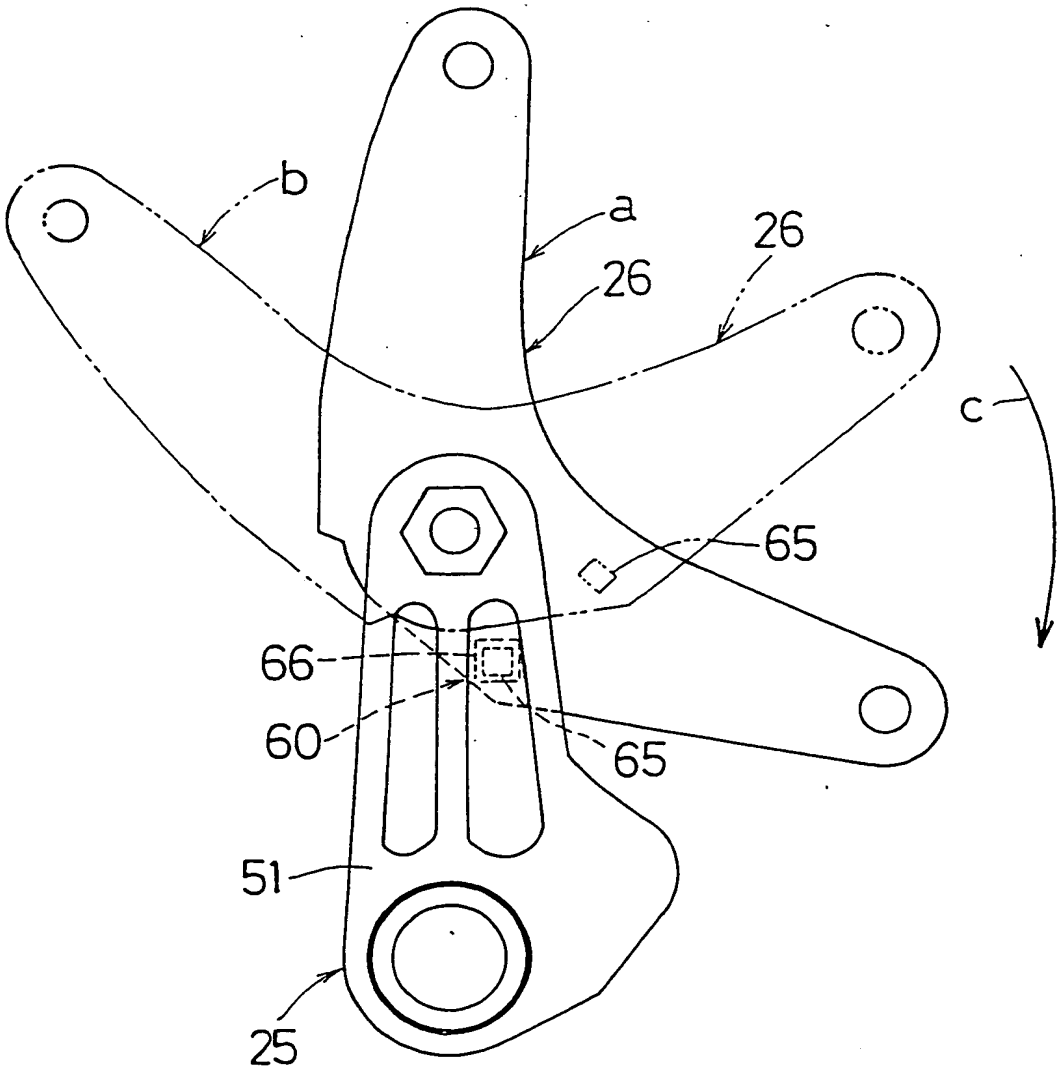


FIG.17

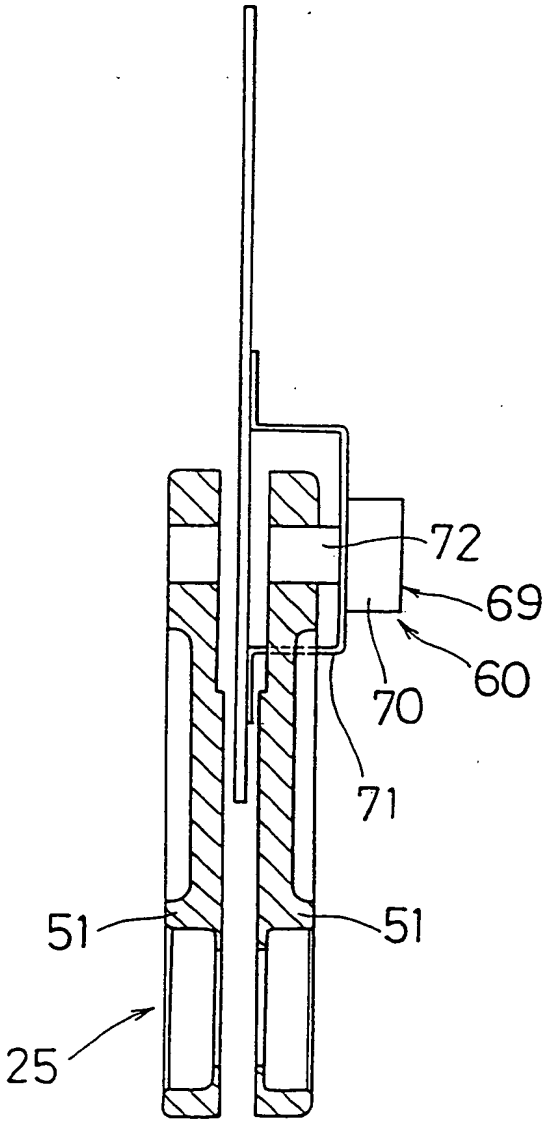


FIG.18

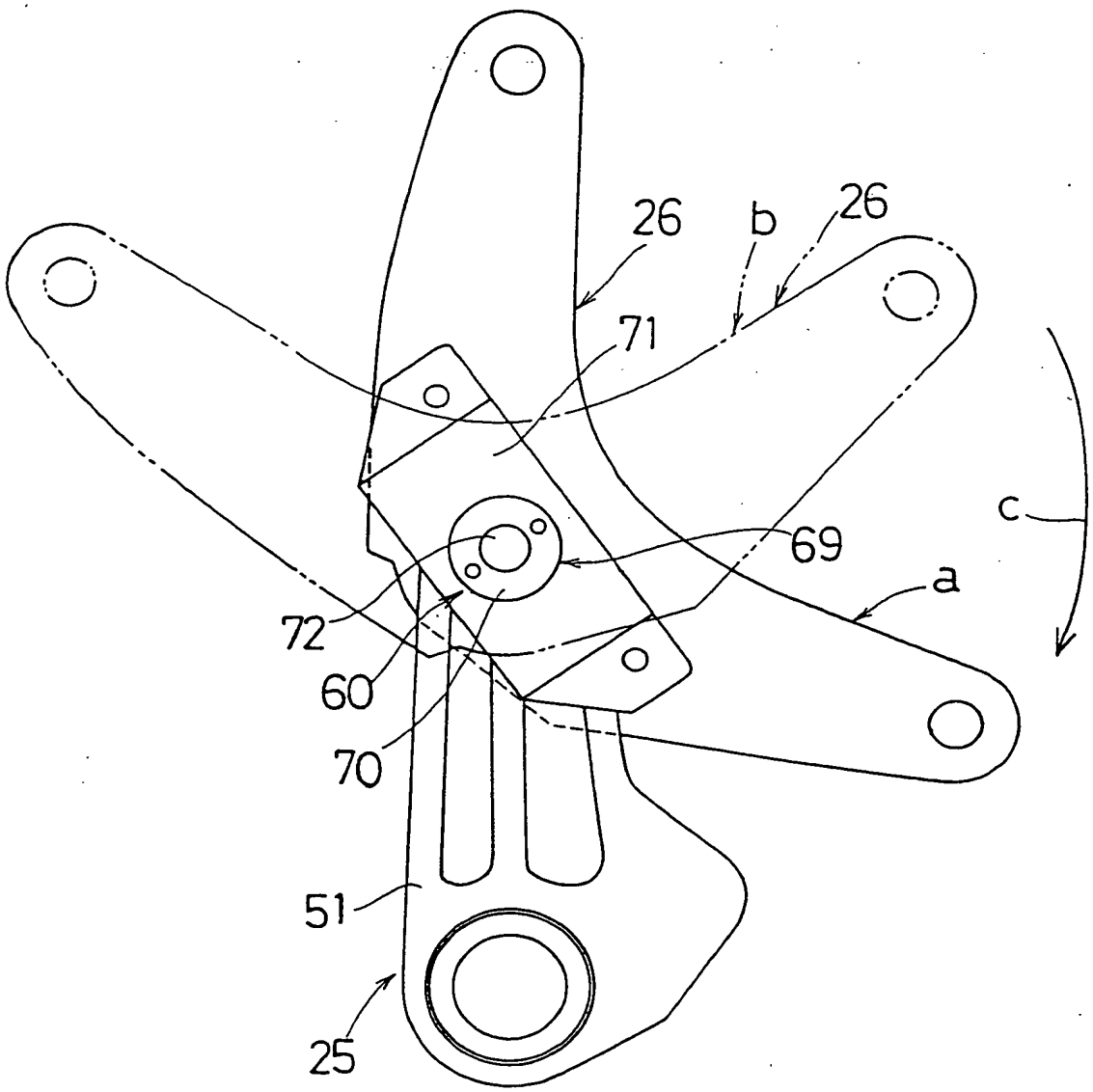
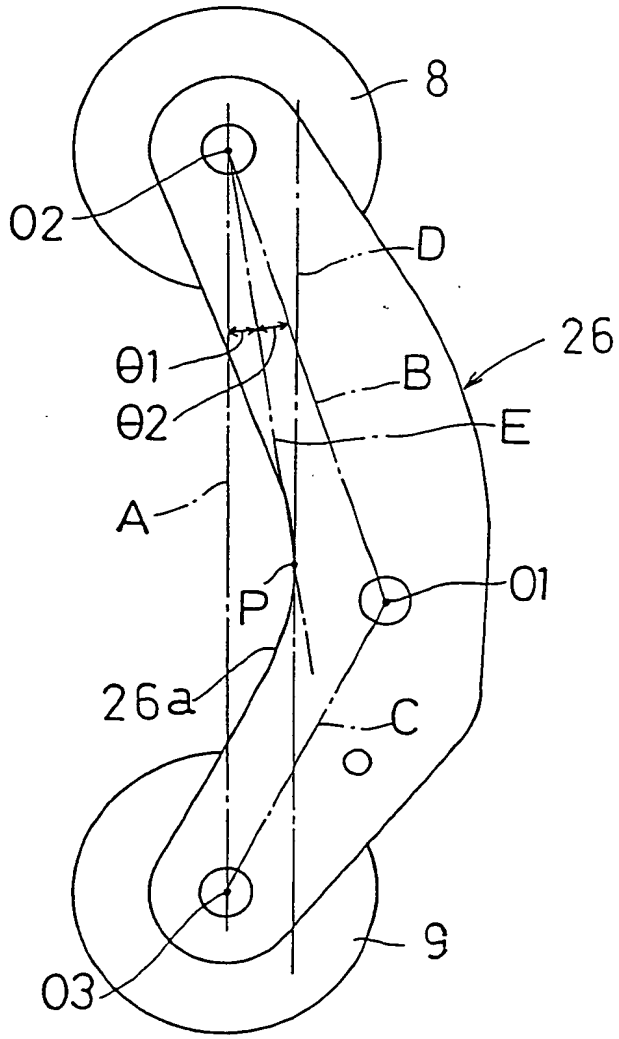


FIG.19



[Document Name] Abstract of the Disclosure

[Abstract]

[Object]

To provide a massaging apparatus which has a simple construction and can automatically and accurately determine the position of the specific portion of the user such as the shoulder position with respect to the massaging apparatus.

[Means for Solving the Problem]

A massaging apparatus including a supporting arm 26 having a therapeutic member and being pivotally supported thereon and movable along the body of a user is configured to determine the position of specific portion of the user with respect to the massaging apparatus from the relation between the vertical position of the supporting arm 26 and the pivotal position of the supporting arm 26. The massaging apparatus is further provided with a pivotal-position-detecting sensor 60 for detecting that the supporting arm 26 reached a prescribed range of pivotal movement. The massaging apparatus is further provided with a pivotal-position-detecting sensor 60 for detecting the pivotal position of the supporting arm 26. The massaging apparatus is configured to determine the position of the specific portion of the user with respect to the massaging apparatus from the vertical position of the supporting arm 26 at the moment when the pivotal position of the supporting arm 26 reached a prescribed range.